IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Toshiharu Furukawa, et al.	Confirmation No. 6152
Serial No.:	10/777,576	
Filing Date:	February 12, 2004	
Examiner:	Ori Nadav	
Art Unit:	2811	
Title:	**VERTICAL CARBON NANOTUBE FIELD EFFECT TRANSISTORS AND ARRAYS**	
Atty. Docket No.:	ROC920030271US1	

RESPONSE UNDER 37 C.F.R. § 1.111

Mail Stop AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This paper is responsive to the non-final Office Action mailed on October 31, 2006. Claims 1, 3-13, 15-20 and 34-53 are pending. Claims 9-13, 20, 36, 38-42, and 49-51 are withdrawn from consideration. In view of the following remarks, Applicants respectfully submit that this application is in complete condition for allowance and request reconsideration of the application in this regard.

Drawing Objection

The drawings stand objected to under 37 CFR 1.83(a) as not showing a plurality of nanotubes (42) as recited in claim 4. Dependent claim 4 recites "a plurality of semiconducting carbon nanotubes extending vertically at a plurality of locations adjacent to said vertical sidewall of said gate electrode." Applicants direct the Examiner's attention to Figure 7A. Multiple

nanotubes (42) are visible on the active area (34) of three of the four catalyst pads (16) shown in Figure 7A. The presence of multiple nanotubes (42) on one of the active area (34) of the catalyst pad (16) is reflected on the right hand side of the view in Figure 7B. Applicants' specification describes that each active area (34) supports the synthesis of one or more semiconducting carbon nanotubes (42). *See* page 9, lines 19-20. Based upon this evidence, a person having ordinary skill in the art would understand that the drawings in the application show that the device structure (54) can include a plurality of nanotubes (42), as set forth in claim 4. Consequently, Applicants respectfully request that the Examiner withdraw the objection.

Rejections of Claims under 35 U.S.C. § 103(a)

Claim 1, 3-8, 15-19, 34, 35, 37, 43-48, 52, and 53 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,515,325 to Farnworth et al. (hereinafter *Farnworth*) in view of U.S. Publication No. 2004/0027889 to Occhipinti et al. (hereinafter *Occhipinti*). Claims 1 and 43 represent independent claims. Applicants respectfully disagree.

With regard to independent claims 1 and 43, a person having ordinary skill in the art would understand that *Farnworth* fails to disclose or suggest "at least one semiconducting carbon nanotube extending substantially vertically between opposite first and second ends at a location adjacent to said vertical sidewall of said gate electrode", "a first contact electrically coupled with said first end of said at least one semiconducting carbon nanotube" and "a second contact electrically coupled with said second end of said at least one semiconducting carbon nanotube."

According to MPEP § 2111.01, words of the claim must be given their plain (i.e., ordinary and customary) meaning unless a clear definition is provided in the specification. The plain meaning is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application.

The plain meaning of the term "end" would have been "either extremity of something that has a length." *See, e.g.,* The American Heritage Dictionary, 3rd Ed., p. 453. "Extremity" may be defined as "the outermost or farthest point or portion." *See, e.g.,* The American Heritage Dictionary, 3rd Ed., p. 486. The nanotube (22) in *Farnworth* has an inverted U-shape. Based on the plain meaning of the term "end" and the definition of "extremity," a person having ordinary skill in the art would comprehend that a first "end" of the U-shaped nanotube (22) in *Farnworth* is electrically coupled with the source (17) of device (10). However, the second "end" of the U-shaped nanotube (22) is not electrically coupled with the drain (21) of device (10). Instead, the first and second ends (i.e., the lengthwise extremities) of the nanotube (22) are both electrically coupled with the source (17). Applicants have not given a clear definition in the specification of the term "end" that would contradict the plain meaning.

Because of the deficiencies in *Farnworth* that *Occhipinti* fails to remedy, this combination of references fails to include every element set forth in Applicants' independent claims 1 and 43. For at least this reason, Applicants submit that the Examiner has failed to properly support a case of *prima facie* obviousness. Therefore, Applicants respectfully request that the Examiner withdraw this rejection.

Independent claims 1 and 43 are patentable for additional reasons, as remarked below.

Specifically, a person having ordinary skill in the art would not have combined *Occhipinti* with *Farnworth* because there is no suggestion to make the combination. The Examiner relies on *Occhipinti* to remedy deficiencies in *Farnworth* and contends that *Occhipinti* discloses that "a memory device conventionally uses an array characterized by a plurality of rows and a plurality of columns (paragraph [0010])." However, *Occhipinti* fails to disclose or suggest how the rows and columns of the array would be arranged, or connections for the rows and columns would be established, for the device structures disclosed in *Farnworth* that include nanotubes having source and drain connections in the form of conductive rings that are not

located at the ends of the nanotubes. In the absence of a proper suggestion or motivation to combine *Occhipinti* with *Farnworth*, the Examiner has failed to support *prima facie* obviousness. See MPEP § 2143. For this reason alone, Applicants respectfully request that the Examiner withdraw this rejection.

Occhipinti actually teaches away from the claimed invention. Specifically, *Occhipinti* discloses that the memory can include nanotubes. However, *Occhipinti* discloses that the nanotubes are arranged in multiple layers (Figs. 2, 3a, 3b) or in a thin layer (4) as shown in Figure 14. In the former layered arrangement, either a layer of molecules is required between the layers of nanotubes or information is somehow written at the crossing points between nanotubes in different layers in conjunction with an electrostatic interaction with the substrate. *See* paragraphs [0025] and [0031] of *Occhipinti*. In the latter arrangement, a nanoactuator (5) is required to deform the nanotube layer (4) to write data and an optical reading block (9) is required to read the output from the nanotube layer (4). *See, e.g.,* paragraphs [0085] – [0095]. A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *See* MPEP §§ 2141.02(VI), 2143.01 (II). For this additional reason, the Examiner has failed to support *prima facie* obviousness. Consequently, Applicants respectfully request that the Examiner withdraw this rejection.

Furthermore, any attempt to modify *Farnworth* based upon the disclosure *Occhipinti* would change the principle of operation of *Farnworth*. *Occhipinti* discloses a nanotube layer (4) and that a nanoactuator (5) and an optical reading block (9) are required to read and write data to the nanotube layer (4). *See, e.g.,* paragraphs [0085] – [0095]. Alternatively, *Occhipinti* discloses nanotubes arranged in layers and that a layer of molecules between nanotube layers are required to read and write data. *See* paragraph [0025]. Alternatively, *Occhipinti* discloses nanotubes arranged in layers and that information is somehow written at the crossing points between the nanotubes in different layers in conjunction with an electrostatic interaction with the

substrate. *See* paragraph [0031]. However, *Occhipinti* fails to disclose that any of these disclosed approaches would work for reading and writing data to the device structures in *Farnworth* that include nanotubes having source and drain connections in the form of conductive rings that are not located at the ends of the nanotubes. To attempt to make such a modification to the device structures in *Farnworth* would change the principle of operation for writing data to, and reading data from, the device structures disclosed in *Farnworth*. This is not permitted. *See* MPEP §§ 2143.01(VI). For this additional reason, the Examiner has failed to support *prima facie* obviousness. Consequently, Applicants respectfully request that the Examiner withdraw this rejection.

According to MPEP § 2143, the prior art can be modified or combined to reject claims as prima facie obvious as long as there is a reasonable expectation of success. In this instance, a person having ordinary skill in the art would not appreciate from the disclosure found at paragraph [0010] of *Occhipinti* that a reasonable expectation of success exists to combine *Occhipinti* with *Farnworth* if the device structures are not conventional but instead are configured as disclosed in *Farnworth* with nanotubes having source and drain connections in the form of rings that are not located at the ends of the nanotubes. The Examiner has failed to support *prima facie* obviousness for this additional reason. Consequently, Applicants respectfully request that the Examiner withdraw this rejection.

Because claims 3-8, 15-19, 34, 35, and 37 depend from independent claim 1 and claims 44-48, 52, and 53 depend from independent claim 43, Applicants submit that these claims are also patentable for at least the same reasons discussed in Applicants' preceding remarks. Furthermore, each of these claims recites a unique combination of elements not disclosed or suggested by the combination of *Occhipinti* with *Farnworth*.

Conclusion

Applicants have made a bona fide effort to respond to each and every requirement set forth in the Office Action. In view of the foregoing remarks, this application is submitted to be in complete condition for allowance and, accordingly, a timely notice of allowance to this effect is earnestly solicited. In the event that any issues remain outstanding, the Examiner is invited to contact the undersigned to expedite issuance of this application.

Applicants do not believe fees are dues in connection with filing this communication. If, however, any fees are necessary as a result of this communication, the Commissioner is hereby authorized to charge any under-payment or fees associated with this communication or credit any over-payment to Deposit Account No. 23-3000.

Respectfully submitted,

January 26, 2007
Date

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